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Nanoscale Science and Engineering (NSE)

Program Solicitation for FY2001

NSF 00-119

DEADLINE DATE : November 2, 2000

For full proposals, Nanoscale Interdisciplinary Research Teams (NIRT) and Nanoscale Exploratory Research (NER)

DEADLINE DATE : ***For Nanoscale Science and Engineering Centers (NSEC)***

- ***Letters of intent (optional) are due on September 18, 2000***
- ***Preproposals are due on November 2, 2000***
- ***Full proposals are due on January 30, 2001***

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Name: NANOSCALE SCIENCE AND ENGINEERING

Synopsis of Program:
The National Science Foundation (NSF) announces a program on collaborative research in the area of nanoscale science and engineering. The goal of this program is to catalyze synergistic science and engineering research in emerging areas of nanoscale science and technology, including: biosystems at nanoscale; nanoscale structures, novel phenomena, and quantum control; device and system architecture; design tools and nanosystems specific software; nanoscale processes in the environment; multi-scale, multi-phenomena modeling and simulation at the nanoscale; and studies on societal implications of nanoscale science and engineering. Individual investigator research in nanoscale science and engineering will continue to be supported in the relevant Programs and Divisions outside of this solicitation. This solicitation will provide support for: Nanoscale Interdisciplinary Research Teams (NIRT), Nanoscale Science and Engineering Centers (NSEC), and Nanoscale Exploratory Research (NER).

Cognizant NSF Staff:
Questions concerning the NSE initiative should be addressed to one of the following NSF staff members in the appropriate directorate(s), or to program directors in the appropriate area of research and education. The participating directorates are:

- ***DIRECTORATE FOR BIOLOGICAL SCIENCES*** (http:/www.nsf.gov/bio)

Eve I. Barak, Division of Molecular & Cellular Biosciences (ebarak@nsf.gov)
Christopher J. Platt, Division of Integrative Biology & Neuroscience (cplatt@nsf.gov)
Mary Jane Saunders, Division of Biological Infrastructure (msaunder@nsf.gov)
Carol A. Johnston, Division of Environmental Biology (cajohnsto@nsf.gov)

- ***DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING*** (http:/www.nsf.gov/cise)

Frederica Darema, Division of Experimental and Integrative Activities (fdarema@nsf.gov)
Kamal Abdali, Division of Computer-Communication Research (kabdali@nsf.gov)
Suzanne Iacono, Division of Information and Intelligent Systems (siacono@nsf.gov)

- ***DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES*** (http://www.nsf.gov/ehr)

John C. Cherniavsky, Senior EHR Advisor for Research (jchernia@nsf.gov)
Karolyn K. Eisenstein, Division for Undergraduate Education (keisenst@nsf.gov)

- ***DIRECTORATE FOR ENGINEERING*** (http:/www.nsf.gov/eng)

Cheryl A. Cathey, Division of Engineering Education and Centers (ccathey@nsf.gov)
Rajinder Khosla, Division of Electrical and Communication Systems (rkhosla@nsf.gov)
Jorn Larsen-Basse, Division of Civil and Mechanical Systems (jlarsenb@nsf.gov)
Geoff Prentice, Division of Chemical and Transport Systems (gprentic@nsf.gov)
Kamlakar P. Rajurkar, Division of Design, Manufacture and Industrial Innovation (krajurka@nsf.gov)
Mihail C. Roco, Division of Chemical and Transport Systems Division (mroco@nsf.gov)

(Coordinator of the NSF NSE initiative)
Sohi Rastegar, Division of Biengineering and Environmental Systems (srastega@nsf.gov)

- ***DIRECTORATE FOR GEOSCIENCES*** (http://www.nsf.gov/geo)

David D. Lambert, Division of Earth Sciences (dlambert@nsf.gov)
Anne-Marie Schmoltner, Division of Atmospheric Sciences (aschmolt@nsf.gov)
David L. Garrison, Division of Ocean Sciences (dgarriso@nsf.gov)

- ***DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES*** (http://www.nsf.gov/mps)

J.A. Akkara, Chemistry Division (jakkara@nsf.gov)
Donald M. Burland, Chemistry Division (dburland@nsf.gov)
C. Denise Caldwell, Physics Division (dcaldwel@nsf.gov)
W. Lance Haworth, Division of Materials Research (lhaworth@nsf.gov)
Laverne Hess, Division of Materials Research (lhess@nsf.gov)
Peter Polyakov, Division of Mathematical Sciences (ppolyak@nsf.gov)
Ulrich Strom, Division of Materials Research (ustrom@nsf.gov)

- ***DIRECTORATE FOR SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES*** (http://www.nsf.gov/sbe)

William Bainbridge, Office of the Assistant Director (wbainbri@nsf.gov)

- ***DIVISION OF INTERNATIONAL PROGRAMS*** (http://www.nsf.gov/sbe/int)

Mark Suskin, International Programs (msuskin@nsf.gov)
Francis J. Wodarczyk, International Programs (fwodarcz@nsf.gov)

Applicable Catalog of Federal Domestic Assistance (CFDA) Numbers

47.074 (BIO), 47.070 (CISE), 47.041 (ENG), 47.050 (GEO), 47.049 (MPS), 47.075 (SBE).

A. Nanoscale Interdisciplinary Research Teams (NIRT)

ELIGIBILITY INFORMATION

- **Organization Limit:** U.S. academic institutions with significant research and degree-granting education programs in disciplines normally supported by NSF are eligible to be the lead institution in NIRTs.
- **PI Eligibility Limit:** No individual may appear as PI or co-PI on more than 2 proposals for NIRT.
- **Limit on Number of Proposals:** No institution may submit more than four NIRT proposals as lead institution.

AWARD INFORMATION

- **Anticipated Type of Award:** Standard and Continuing NIRT grants
- **Estimated Number of Awards:** Depending upon appropriations, we anticipate funding approximately 35-45 NIRT awards.
- **Anticipated Funding Amount:** Approximately $74 million has been planned for NIRT, NSEC and NER awards for this program solicitation in FY 2001, subject to availability of funds. Additional funding for individual awards and focused areas is available through the relevant NSF programs.
- **Estimated Award Size**: A NIRT award will be in the range $250,000 - $500,000 per year for up to four years.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A1. Proposal Preparation Guidelines

- **Proposal Preparation Instructions:** Supplemental Preparation Guidelines
  The program solicitation supplements the standard GPG proposal preparation guidelines to permit explanation of integrative plans for NIRT. Please see section A in solicitation for further information.

A2. Budgetary Information

- **Cost Sharing Requirements:** No Cost Sharing is required for NIRT.
- **Indirect (F&A) limitations:** None.

A3. FastLane Requirements

- **FastLane Submission:** FastLane is required for proposals
- **Fast Lane Contact:** FastLane User Support at 1-800-673-6188, or fastlane@nsf.gov by email.

***A4. Deadlines*:** November 2, 2000 for NIRT proposals.

B. Nanoscale Science and Engineering Centers (NSEC)

ELIGIBILITY INFORMATION

- **Organization Limit:** NSECs may be based at a single institution or may consist of a lead institution in partnership with one or more partner institutions. U.S. academic institutions with undergraduate and Ph.D. programs in disciplines normally supported by NSF are eligible to be the lead institution. Partnerships of the lead institution with other universities/colleges are encouraged.
- **PI Eligibility Limit:** None.
- **Limit on Number of Proposals:** No institution may submit more than two preproposals. Full proposals may be submitted only by invitation from NSF.
- **Cost sharing:** 10% of the total amount requested from NSF.

AWARD INFORMATION

- **Anticipated Type of Award:** Cooperative Agreement.
- **Estimated Number of Awards:** Depending upon appropriations, we anticipate funding approximately 6-10 NSEC awards.
- **Anticipated Funding Amount:** Approximately $74 million has been planned for NIRT, NSEC and NER awards for this program solicitation in FY 2001, subject to availability of funds. Additional funding for individual awards and focused areas is available through the relevant NSF programs.
- **Estimated Award Size**: A NSEC award will be in the range from approximately $1 million to $4 million per year for five years; centers will be eligible to compete for one further five-year renewal.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

B1. Proposal Preparation Guidelines

- **Proposal Preparation Instructions:** Supplemental Preparation Guidelines
  The program solicitation supplements the standard GPG proposal preparation guidelines to permit explanation of management and collaborative plans for NSECs. Please see below for further information.
- **Preproposals:** Must be submitted

B2. Budgetary Information

- **Cost Sharing Requirements:** NSEC requires cost-sharing at 10% of the total requested from NSF.
- **Indirect (F&A) limitations:** None.

B3. FastLane Requirements

- **FastLane Submission:** FastLane is required for preproposals and full proposals.
- **Fast Lane Contact:** FastLane User Support at 1-800-673-6188, or fastlane@nsf.gov by email.

***B4. Deadlines*:** September 18, 2000, for letters of intent (optional); November 2, 2000, for preproposals; and January 30, 2001 for full proposals by invitation (see section B in the solicitation further information on NSEC).

C. Nanoscale Exploratory Research (NER)

ELIGIBILITY INFORMATION

- **Organization Limit:** Proposals may be submitted by U.S. academic institutions with undergraduate and/or Ph.D. programs in disciplines usually supported by NSF.
- **PI Eligibility Limit:** None.
- **Limit on Number of Proposals:** No institution may submit more than four NER proposals as lead institution.

AWARD INFORMATION

- **Anticipated Type of Award:** Standard grants.

- **Estimated Number of Awards:** Depending upon appropriations, we anticipate funding approximately 50-60 NER awards.
- **Anticipated Funding Amount:** Approximately $74 million has been planned for NIRT, NSEC and NER awards for this program solicitation in FY 2001, subject to availability of funds. Additional funding for individual awards and focused areas is available through the relevant NSF programs.
- **Estimated Award Size**: NER awards will not exceed $100,000 and generally will be limited to one year.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

C1. Proposal Preparation Guidelines

- **Proposal Preparation Instructions:** Supplemental Preparation Guidelines
  The program solicitation supplements the standard GPG proposal preparation guidelines to permit explanation of exploratory characteristics of NER. Please see below for further information.

C2. Budgetary Information

- **Cost Sharing Requirements:** Cost sharing is not required for NER.
- **Indirect (F&A) limitations:** None.

C3. FastLane Requirements

- **FastLane Submission:** FastLane is required for proposals.
- **Fast Lane Contact:** FastLane User Support at 1-800-673-6188, or fastlane@nsf.gov by email.

***C4. Deadlines*:** November 2, 2000 for NER proposals.

TABLE OF CONTENTS

SUMMARY OF PROGRAM REQUIREMENTS

I. INTRODUCTION

II. PROGRAM DESCRIPTION
RESEARCH THEMES
MODES OF SUPPORT

A. NANOSCALE INTERDISCIPLINARY RESEARCH TEAMS (NIRT)

IIa. GOALS AND STRUCTURE
IIIa. ELIGIBILITY INFORMATION
IVa. AWARD INFORMATION
Va. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS
VIa. PROPOSAL REVIEW INFORMATION

B. NANOSCALE SCIENCE AND ENGINEERING CENTERS (NSEC)

IIb. GOALS AND STRUCTURE
IIIb. ELIGIBILITY INFORMATION
IVb. AWARD INFORMATION
Vb. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS
Letters of Intent
Preproposal
Full Proposal
VIb. PROPOSAL REVIEW INFORMATION

C. NANOSCALE EXPLORATORY RESEARCH (NER)

IIc. GOALS AND STRUCTURE
IIIc. ELIGIBILITY INFORMATION
IVc. AWARD INFORMATION
Vc. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS
VIc. PROPOSAL REVIEW INFORMATION
General NSF review criteria
a. NSF Proposal Review Process
b. Review Protocol and Associated Customer Service Standard

VII. AWARD ADMINISTRATION INFORMATION
a. Notification of the Award
b. Award Conditions
c. Reporting Requirements

VIII. CONTACTS FOR ADDITIONAL INFORMATION

IX. OTHER PROGRAMS OF INTEREST

ABOUT THE NATIONAL SCIENCE FOUNDATION

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

I. INTRODUCTION

One nanometer (one billionth of a meter) is a magical point on the dimensional scale. Nanostructures are at the confluence of the smallest of human-made devices and the large molecules of living systems. Nanoscale science and engineering here refer to the fundamental understanding and resulting technological advances arising from the exploitation of new physical, chemical and biological properties of systems that are intermediate in size, between isolated atoms and molecules and bulk materials, where the transitional properties between the two limits can be controlled. During the last few years novel structures, phenomena and processes have been observed at the nanoscale (from a fraction of nanometer to about 100 nm) and new experimental, theoretical and simulation tools have been developed for their investigating. These advances provide fresh opportunities for scientific and technology developments in nanoparticles, nanostructured materials, nanodevices and systems.

Nanotechnology is the creation and utilization of functional materials, devices and systems with novel properties and functions that are achieved through the control of matter atom by atom, molecule by molecule or at the macromolecular level. A revolution has begun in science, engineering and technology, based on the ability to organize, characterize, and manipulate matter systematically at the nanoscale. Far-reaching outcomes for the 21st century are envisioned in both scientific knowledge and a wide range of technologies in most industries, healthcare, conservation of materials and energy, biology, environment and education. Nanoscale science and engineering (NSE) underpin innovation in critical areas ranging from manufacturing to medicine. Opportunities have opened as new tools permit for fundamental discoveries and technology use. Outstanding benefits have resulted from initial applications. A special challenge and opportunity is restructuring teaching at all levels to include NSE concepts, and nurturing the scientific and technical workforce of the next century.

Formidable challenges remain, however, in the areas of fundamental understanding, device design, system design and architecture, manufacturing, and system integration and deployment before the potential of nanotechnology becomes a reality. Key research areas have been identified in advanced materials, nanobiotechnology, nanoelectronics, advanced healthcare, environmental improvement, efficient energy conversion and storage, space exploration, economical transportation, and bionanosensors. The National Nanotechnology Initiative (NNI - this document was published on February 7, 2000 and is available on Internet at http://www.nsf.gov/nano or http://www.nano.gov) will ensure that investments in this area are made in a coordinated and timely manner, and will accelerate the pace of revolutionary discoveries now occurring in NSE. Collaborative research among physicists, chemists, biologists, materials scientists, geoscientists, mathematicians, computer scientists and engineers will be necessary.

The NSF's mission is to promote the progress of science, engineering and related education in the United States. Its role in supporting research and education is particularly important in creating infrastructure in emerging areas such as NSE. NSF also promotes partnerships, including collaboration with other agencies, industry and national laboratories for projects of mutual interest. International collaborations with centers of excellence abroad are encouraged.

The pace of revolutionary discoveries we are currently witnessing in nanoscience and technology is expected to accelerate greatly in the next decade. This will have profound implications on existing technologies and could result in the development of completely new technologies, improvements in health, the conservation of materials and energy, and a sustainable environment. Awards made in response to this solicitation will contribute to such future advancements.

This Solicitation, previous announcements, and additional information concerning related activities such as workshops and publications, including the "Nanotechnology Research Directions" (1999) prepared by the National Science and Technology Council, are available on-line at http://www.nsf.gov/nano .

II. PROGRAM DESCRIPTION

RESEARCH THEMES

This initiative focuses on six high-risk/high-reward research and education areas, where special opportunities exist for fundamental studies in nanoscale science and engineering. The six areas are:

- *Biosystems at the Nanoscale*. Research in this area supports the development of a fundamental understanding of nanobiostructures and processes, nanobiotechnology, and techniques for a broad range of applications in biomaterials, biosystem-based electronics, agriculture, energy, and health. The goal is to stimulate progress in the study of biological and biologically inspired systems in which nanostructures play an important role. This includes developing an understanding of the relationships among chemical composition, physical shape at the nanoscale and biological function. Biosynthesis and bioprocessing offer fundamentally new ways to manufacture nanostructured products, including novel biomaterials, improved delivery of bioactive molecules, nanoscale sensory systems, biochips, and the modification of existing biomolecular machines for new functions.

- *Nanoscale Structures, Novel Phenomena, and Quantum Control.* Research in this area explores the novel phenomena and material structures that appear at the nanoscale. This research is critical to overcoming obstacles to miniaturization as feature sizes in devices reach the nanoscale. Research in this area also refers to development of the experimental tools necessary to characterize and measure nanostructures and phenomena, and development of techniques for synthesis and design. Examples of possible benefits include molecular electronics, nanostructured catalysts, advanced drugs, quantum computing, DNA computing, the development of high capacity computer memory chips, production of two- and three-dimensional nanostructures "by design", nanoscale fluidics, control of surface processes and lubrication.

- *Nanoscale Devices and System Architecture*. New concepts and design methodologies are needed to create new nanoscale devices, synthesize nanosystems and their integration into architectures for various operational environments. These require a profound understanding of the physical, chemical and biological interactions among nanoscale components. Research in this area includes development of new tools for sensing, assembling, processing, manipulating, manufacturing and integration along scales, controlling and testing nanostructures, devices and architectures, software specialized for nanosystems, and design automation tools for architecting systems of large numbers of heterogeneous nanocomponents. It also includes investigations of quantum algorithms and means for error correction in quantum information systems. One can envision "smart" systems that sense and gather information and analyze and respond to it, more powerful computing systems and architectures, and novel separation systems with molecular resolution.

- *Nanoscale Processes in the Environment.* Research in this area will focus on probing nanostructures and processes of relevance in the environment from the Earth's core to the upper atmosphere and beyond. Emphasis will be on understanding the distribution, composition, origin, and behavior of nanoscale structures under a wide variety of naturally occurring physical/chemical conditions, including nanoscale interactions at the interface between organic and inorganic solids, liquid and gases, and between living and non-living systems. Examples are biomineralization of nanoscale structures, molecular studies of mineral surfaces, study of transport of ultrafine colloidal particles and aerosols, and study of interplanetary dust particles. Possible benefits of nanoscale studies include better understanding of molecular processes in

the environment, the development of manufacturing processes that reduce pollution, new water purification techniques and artificial photosynthetic processes for clean energy, development of environmental biotechnology, and understanding the role of surface microbiota in regulating chemical exchanges between mineral surfaces and water or air.

- *Multi-scale, Multi-phenomena Theory, Modeling and Simulation at the Nanoscale.* The emergence of new behaviors and processes in nanostructures, nanodevices and nanosystems creates an urgent need for theory, modeling, large-scale computer simulation and new design tools in order to understand, control and accelerate development in new nanoscale regimes and systems. Research on theory, mathematical methods, modeling and simulation of physical, chemical and biological systems at the nanoscale will include techniques such as quantum mechanics and quantum chemistry, multi-particle simulation, molecular simulation, grain and continuum-based models, stochastic methods, and nanomechanics. Approaches that make use of more than one such technique and focus on their integration will play an important role in this effort. The interplay of coupled, time-dependent and multiscale phenomena and processes in large atomistic and molecular systems will be encouraged. A critical issue is the ability to make connection between structures, properties and functions. Examples of possible benefits include better understanding of processes in chemistry, biology, physics, materials science and engineering, and the geosciences, and realization of functional nanostructures and architectures "by design" such as new chemicals, multifunctional materials, bioagents and electronic devices.

- *Societal and Education Implications of Scientific and Technological Advances on the Nanoscale.* Exploitation of scientific and engineering advances at the nanoscale will impact society in expected and sometimes unexpected ways. Nanoscience is likely to enhance understanding of the universe, from living systems to astronomy. The development and use of nanoscale technologies is likely to change the design, production and use of many goods and services, ranging from vaccines to computers to automobile tires. In order to understand the scope and influence of these changes, and anticipate and respond effectively to them, research on the ethical, legal, social, economic and workforce implications of nanotechnology is necessary. Studies might include, for example: economic assessments and business models for nanoscale development and use; knowledge barriers preventing the adoption of nanotechnology by commercial firms; educational needs; life cycle assessment of manufacturing processes; the ethical and legal ramifications of nanotechnology in health, medicine, law, and the environment; an understanding of its diffusion patterns; how the public understands nanoscience and technology; and the implications of nanotechnology for everyday life. Each of the first five themes will emphasize the integration of research and education, including course development, student fellowships, and other aspects according to the nature of the project. This theme aims at a long-term vision for educational implications of nanoscience and nanotechnology.

MODES OF SUPPORT

This initiative will support collaborative research and education activities of the following types:

A. Nanoscale Interdisciplinary Research Teams (NIRT)
B. Nanoscale Science and Engineering Centers (NSEC)
C. Nanoscale Exploratory Research (NER)

Each of these modes of support is described separately below. Much of the research that NSF supports in nanoscale science and engineering will be done by individual investigators. Individual investigator research in

nanoscale science and engineering will continue to be supported in the relevant Programs and Divisions outside of this solicitation. In addition, it is anticipated that existing programs for NSF centers and facilities, the Integrative Graduate Education and Research Traineeships, Combined Research and Curriculum Development, and SBIR/STTRs will also support research in this general area. Principal Investigators are encouraged to examine all of the opportunities within the NSF to determine which of them is best for their particular proposed activities and to contact the appropriate Program Officers with questions.

A. NANOSCALE INTERDISCIPLINARY RESEARCH TEAMS (NIRT)

IIa. GOALS AND STRUCTURE

Research areas in nanoscale science and engineering are inherently interdisciplinary. This initiative encourages team approaches to address research topics where a synergistic blend of expertise is needed to make significant contributions. The Nanoscale Interdisciplinary Research Teams (NIRT) activity will support small collaborative groups of three or more investigators at the faculty level or equivalent. The award size per project is anticipated to be between $250,000 and $500,000 per year with duration up to four years.

NIRT proposals should have the following characteristics:

- An integrating research focus around one or a combination the six themes described in section II
- Partnerships
- A clearly identified team with the skills necessary to pursue the research theme
- Components aimed at the development of a skilled workforce and an informed public in nanoscience and technology.

A grantees' conference at NSF (Arlington, Virginia) at the end of the second year will review the progress of the research groups and centers, exchange information, and promote collaborations among NIRTs and NSECs. At least one investigator from each funded research team will be required to participate. Funds should be included in the NIRT proposal for attendance at this conference.

Additional supplements for international opportunities will be made available on a competitive basis to the projects selected for funding.

IIIa. ELIGIBILITY INFORMATION

NIRT proposals may be submitted by a single institution or may consist of a lead institution in partnership with one or more partner institutions. U.S. academic institutions with significant research and degree-granting education programs in disciplines normally supported by NSF are eligible to be the lead institution. Principal investigators are encouraged to form synergistic collaborations with industry, government laboratories, and scientists and engineers at foreign institutions where appropriate, though no funds will be provided to those organizations. Collaborations between university and industry researchers using the approach of the GOALI (Grant Opportunities for Academic Liaison with Industry, NSF 98-142, http://www.nsf.gov/goali) are encouraged. Primary support for any foreign participants / activities must be secured through their own national sources.

NSF does not normally support technical assistance, pilot plant efforts, research requiring security classification, the development of products for commercial marketing or market research for a particular project or invention. Research with disease-related goals, including work on the etiology, diagnosis or

treatment of physical or mental disease, abnormality or malfunction in human beings or animals, is normally not supported. Animal models of such conditions or the development or testing of drugs or other procedures for their treatment also are not eligible for support. Research in bioengineering, with diagnosis or treatment related goals, however, that apply engineering principles to problems in biology and medicine while advancing engineering knowledge is eligible for support. Bioengineering research to aid persons with disabilities is also eligible.

An institution (university or campus in a multi-campus university) may submit no more than **four** proposals in response to this NIRT solicitation on which it is the lead institution. The same institution may be a collaborative partner in any number of other multi-university group proposals in which it is not the lead. The Authorized Organizational Representative of that institution will make the selection of the proposals that are submitted. Proposals submitted to other NSF programs are not eligible for consideration by this competition. NIRT proposals involving more than one institution must be submitted as a single administrative package with the managing principal investigator from the lead institution.

Synergistic collaboration among researchers and collaborations or partnerships with industry or government laboratories is encouraged. For foreign participants, the U.S. institution may provide funds under participant support costs for travel and per diem for visits to the U.S. institution, as consistent with applicable international agreements. No U.S./NSF funds may go directly to foreign institutions. For this program, collaborating scientists associated with entities such as national laboratories, state agencies, and Federally Funded Research and Development Centers (FFRDC) must be supported by their own institution. However, it is appropriate for students supported through universities to work at an FFRDC or comparable site or for universities to fund research expenses incurred when scientists from such entities work at university sites. Federal employees may not receive salaries or in other ways augment their agency's appropriation through grants made by this program, and no funds for major equipment at FFRDCs are allowed.

IVa. AWARD INFORMATION

A NIRT award will be in the range $250,000 - $500,000 per year for up to four years depending on the scope of the work proposed. Grants may be awarded in a variety of sizes and durations. NSF expects to fund approximately 35-45 NIRTs in FY 2001 depending on the quality of submissions and the availability of funds. Anticipated date of awards: April 2001.

Va. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: http://www.nsf.gov/. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone 301.947.2722 or by e-mail from **pubs@nsf.gov**.

Proposers are reminded to identify the program solicitation number (**NSF 00-119**) in the program announcement/solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*" and to select "**Interdisciplinary Research Teams**" from the FastLane org. unit pull-down list. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

NIRT proposals must conform to the requirements of the *Grant Proposal Guide (GPG)*, NSF 00-2, with three modifications:

- Collaborative research activities should be described and submitted in a single proposal, in which a single award is requested, with subawards administered by the lead institution to any other participating institutions. This solicitation encourages team approaches in the belief that a synergistic blend of expertise is needed to make major headway in research, education, and developing the infrastructure. Budgets for any subawards to different institutions should be included.

- The project description is limited to fifteen pages. In addition, one page is allowed per principal investigator/co-principal investigator for the description of achievements under prior NSF awards within the last five years.

- The project description should include a discussion of the management and education aspects of the project. The proposal should describe the roles to be played by the participating organizations, the responsibilities of the team leader and the activities of associated partners, and arrangements for networking, exchange, and dissemination of data and results. Details on the education and training activities planned as part of the project should be included. Opportunities for students to obtain novel research or educational experiences should be detailed, as well as descriptions of any specific training activities or workshops.

The page limitation guidelines described above will be strictly enforced. The total NSF funding for each project, for all investigators and all institutions, must not exceed $2 million.

Proposals **must be submitted by FastLane** by the sponsored projects office and be received at NSF no later than 5:00 p.m. submitter's local time on November 2, 2000. A proposal may not be processed until the complete proposal (including the signed Cover Sheet) has been received by NSF. The signed cover page for NIRT proposals must be post marked by 5:00 p.m. local time on November 9, 2000.

A proposal is considered complete when the proposal, including the Project Description, has been submitted to NSF.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

NSF 00-119, NIRT, attn. Geoff Prentice, Room 525N
National Science Foundation
DIS-FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

VIa. PROPOSAL REVIEW INFORMATION

NIRT proposals that do not adhere to the requirements in this solicitation (topic, interdisciplinarity, total budget up to $2 million, deadline, and format including page limit) will be returned without review. Eligible proposals will be evaluated in accordance with the general NSF merit review criteria: What is the intellectual merit of

the proposed activity? and What are the broader impacts of the proposed activity? (see section VIc). In addition, the following criteria will be used:

- Potential for significant contributions to the advancement of nanoscale science and engineering in one or more of the six research themes;
- Strength of the collaborations planned and degree of interdisciplinarity;
- Value to education;
- Extent and effectiveness of industrial collaborations, collaborations with national laboratories, and comparable research centers abroad, when applicable. Proposals will be evaluated not by the number of collaborators, but by the quality of the collaboration;
- Effectiveness of the management plan.

Proposal evaluation will be by panel review. Ad-hoc mail reviews may also be obtained as necessary. Panel recommendations will be considered by NSF program officers from the participating programs in making funding decisions.

B. NANOSCALE SCIENCE AND ENGINEERING CENTERS (NSEC)

IIb. GOALS AND STRUCTURE

Nanoscale Science and Engineering Centers (NSECs) will address major opportunities and challenges in nanoscience, engineering, and technology. Proposals for NSECs may focus on one or a combination of the six research themes given in section II.

NSECs will address opportunities that are too complex and multi-faceted for individuals or small groups of researchers to tackle on their own. They will bring together researchers with diverse expertise, in partnership with industry, government laboratories, and/or partners from other sectors, to address complex, interdisciplinary challenges in nanoscale science and engineering, and will integrate research with education both internally and through a variety of partnership activities. Each center, whether based at a single institution or distributed across a number of institutions, must have an overarching research and education theme, well-integrated programs, and a coherent and effective management plan. The NSECs as a whole will span the range from exploratory research, focused on discovery, to technology innovation and will involve a broad spectrum of disciplines such as engineering, mathematics, computer science, the physical sciences, earth science, and biological sciences. The scope of individual centers and the disciplines involved in them will vary.

All NSECs must include the following components:

- A well integrated, cross-disciplinary research program distinguished by intellectual excellence and driven by a clear vision, in which the whole is greater than the sum of the parts;
- A strong emphasis on education, incorporating extensive student participation in the Center's research, and including (as appropriate to the Center) activities in course and curriculum development and effective partnerships to advance pre-college education, workforce training, and/or the public understanding of science and engineering;
- Interdisciplinary fellowship programs for nanoscale science and engineering;
- Effective partnerships with industry, government laboratories, and/or other users of research outcomes;

- Activities to foster human resource development and enhanced participation of under-represented groups in science and engineering.

The centers may also choose to include other activities as appropriate, such as (but not limited to):

- Collaboration with other U.S. and/or international centers, laboratories, and groups, which may include exchange programs for students and faculty
- Shared experimental facilities, including fabrication and/or characterization equipment, equipped and maintained for the benefit of users within and outside the center;
- Collaboration with and access to unique capabilities offered by existing national facilities (such as the National Nanofabrication User Network, synchrotron x-ray facilities, neutron sources, the National High Magnetic Field Laboratory, and advanced computational facilities and resources through partnership with national laboratories and other institutions and centers);
- A systems-level focus that drives the research from discovery through proof-of-concept; including the design and/or development of nanosystems, structures, enabling tools or technology, processes or devices and proof-of-concept testbeds that pull together disparate research efforts to test out a system or complex concept and identify where further research efforts are required[1];
- Programs to address the societal ramifications of advances at nanoscale science and technology.

A grantees' conference at NSF (Arlington, Virginia) at the end of the second year will enable the NIRTs and NSECs to review progress, exchange information, and promote collaborations. At least one investigator from each funded research team will be required to participate. Funds should be included in the NSEC proposals for attendance at this conference.

IIIb. ELIGIBILITY INFORMATION

NSECs may be based at a single institution or may consist of a lead institution in partnership with one or more partner institutions. U.S. academic institutions with undergraduate and Ph.D. programs in disciplines normally supported by NSF are eligible to submit proposals (and preproposals) as the lead institution. Partnerships of the lead institution with other universities/colleges are encouraged.

Preproposals must be submitted (see below).

A single institution cannot be the lead in more than **two** preproposals/proposals. Institutions may be involved as a partner in any number of preproposals/proposals.

In order to reduce the burden of proposal writing for the science and engineering community and the burden of subsequent proposal review and evaluation for reviewers and NSF staff, NSF will accept **full proposals for NSECs by invitation only**, based on the results of the preproposal evaluation. While more than one institution may participate in a single proposal or preproposal, one institution must accept overall management responsibility for the Center.

Cost sharing of 10% of the total amount requested from NSF is required.

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[1]A necessary component for support or partial support from the Engineering Research Centers Program

IVb. AWARD INFORMATION

NSF plans to establish 6-10 NSECs in FY 2001. Each NSEC award will be in the range from about $1 - $4 million per year for five years, depending on the scope of the work proposed. Centers will be eligible to compete for one further five-year renewal. NSF expects to invest approximately $20 million in this solicitation component from fiscal year 2001 funds. Awards will be made as cooperative agreements.

Vb. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Website at: http://www.nsf.gov/.

Proposers are reminded to identify the program solicitation number (**NSF 00-119**) in the program announcement/solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*" and to select "**Science and Engineering Centers**." from the FastLane org. unit pull-down list. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

Letters of intent

E-mail letters of intent are strongly encouraged to facilitate selection of reviewers, but not required. The e-mails should be submitted by the Authorized Institutional Representative to **nano_centers@nsf.gov** by 5 PM proposers time on September 18, 2000, and should include the following: (1) The title of the preproposal, the submitting institution(s), and the name of the PI(s); (2) a list of individuals (and their affiliations) *outside* the participating institutions whose participation in the review of the preproposal might constitute a conflict of interest through association with the participants; (3) a list of individuals who might be suitable to act as impartial reviewers.

Preproposal

The preproposal must be submitted via NSF FastLane by November 2, 2000. The preproposal must be single-spaced in 12-point type, and consist of:

(1) The NSF coversheet showing the name of the proposed Center director (principal investigator), the preproposal title. It is not necessary to submit signed hard copy of page two of NSF Form 1207 for preproposals;

(2) Project Description

2A. A **Narrative, not to exceed 10 pages total**; enter this in the "Project Description" FastLane form. The Narrative must:

- Provide an overview of the center as a whole, including the vision of the Center, a concise rationale for establishing the Center, and an outline of the existing and planned capabilities of the participating institutions in nanoscale science and engineering research and education.
- Describe the proposed research and education activities of the center, indicating clearly which investigators and/or groups of investigators will have primary responsibility for the various aspects of the research and education program

- Describe the activities proposed to integrate research and education, develop human resources, and cooperate with industry and/or other research end-users;
- As appropriate, provide a systems-level focus for the center, and/or plans to develop proof-of-concept testbeds
- As appropriate, describe activities to collaborate with shared experimental facilities, cooperative activities with international partners,
- Give an outline of the proposed arrangements for administration and management of the Center.

2B. A **brief** biographical sketch of the proposed Center Director (**limit 100 words**) immediately following the Narrative;

2C. A **list of participating investigators** (at the faculty level and equivalent) by name, institutional affiliation, and departmental affiliation (additional biographical information is *not* required in the preproposal), and the **names of the principal participating institutions**; include this at the end of the Narrative with a title that clearly identifies the list, and enter in the "project description" FastLane form;

2D. A **one-page synopsis of institutional and other commitments** to the proposed Center; include this at the end of the Narrative with a title that clearly identifies the synopsis, and enter in the "project description" FastLane form;

(3) Budget pages (NSF Form 1030) for the Center including subcontracts to other institutions, as applicable, **for the five year total only,** and a two-page budget justification including the budget for the first year; if more than one institution is involved, include budget pages for each institution **if and only if** the requested funds from NSF exceed $1 million (total over 5 years) for that institution.

Full Proposal

A full proposal may be submitted by January 30, 2001, only by invitation from NSF. A clear disclosure must be made if a related proposal has been submitted or is planned to be submitted to other federal agency.

All full proposals must be submitted via NSF FastLane. The proposal must be single spaced in 12-point type and must contain the following items in the order indicated. **Proposals that exceed the page limitations will be ineligible for consideration and will be returned without review**. Items 3 through 11 described below should be entered in the "Project Description" FastLane form**.**

1. **The two-page NSF Cover Sheet**. Indicate the total amount requested for the five years of NSF support in the box entitled "requested amount."

2. **Table of Contents**. Will be generated automatically by FastLane.

3. **Executive Summary**. Provide a clear vision for and overarching description of the proposed Center and its potential impact. Briefly describe the institutional setting of the Center, its proposed scope and organization, activities in research and education and their integration, development of human resources, collaborative activities with industry and other sectors, links with related major research centers on or off campus, and management plan. **Limit: 3 pages**.

4. **List of Participants**. List each investigator (faculty level or equivalent), by full name, and indicate his or her institutional and departmental affiliation;

5. **Proposed Research**. Provide a concise description of the long-term research goals and intellectual focus of the Center, and describe the planned research activities in sufficient detail to enable their scientific and engineering merit and significance to be assessed. Describe the role and intellectual contribution of each faculty-level participant, and briefly outline the resources available or planned to accomplish the research goals (it will be helpful to underline the name of each investigator wherever it occurs). The need for an interactive, interdisciplinary approach involving a team of investigators, and the means of achieving this, should be clearly established. Describe proposed interactions with other groups and institutions as appropriate. **Limit for this section: 15 pages, including references, diagrams, figures and illustrations.**

6. **Education, Human Resources, and Outreach**. Describe the proposed activities of the Center in education and human resource development, including plans for participation by undergraduates, pre-college students and teachers if appropriate, and members of underrepresented groups. Interdisciplinary fellowships may include undergraduate and graduate students, postdoctoral fellows, senior researchers or faculty. Outline plans for seminar series, colloquia, workshops, conferences, summer schools and related activities, as appropriate. Describe any additional outreach programs not included in other sections of the proposal. **Limit: 5 pages**.

7. **Collaboration with Industry and Other Research End Users**. Describe the proposed interactions and collaborations with industry, and, where appropriate, with other institutions and sectors, including government laboratories and national user facilities, where appropriate. Define the goals of the collaboration, and describe the planned activities. Describe the roles of the senior participants, the mechanisms planned to stimulate and facilitate knowledge transfer, and the potential long-term impact of the collaborations. **Limit: 3 pages**.

8. **Seed Funding and Emerging Areas**. Through this mechanism, NSF intends to provide flexibility for NSECs to respond quickly and effectively to new opportunities. Briefly describe other proposed research plans and related activities, showing clearly how they are related to the mission of the Center. These may include (but are not limited to): seed support for junior faculty and for investigators changing fields; high-risk research projects; the development of tools for remote access to instrumentation; and innovative interdisciplinary educational ventures. Seed funding through the Center is not intended to provide a substitute for NSF individual investigator funding: the criteria and mechanisms for selecting and evaluating projects must be clearly addressed in the management plan. Include the names of key personnel for the first year. **Limit: 3 pages.**

9. **Management**. Describe the plans for administration of the Center, including the functions of key personnel and the role of any advisory committee, executive committee, and/or program committee or their equivalent. Describe the procedures and criteria used to select, administer, and evaluate the research programs of the Center, including seed funding and collaborative programs with other groups and institutions as appropriate. Describe plans for implementing and administering the educational programs and outreach activities of the Center. **Limit: 3 pages**.

10. **Institutional and Other Sector Support**. Outline institutional and other commitments to the Center, including cost sharing funds, space, faculty and staff positions, capital equipment, access to existing facilities, commitments for collaboration and outreach programs, and other commitments. Identify sources of cost sharing and availability. **Limit: 1 page**.

11. **Other Activities**: ***Complete the following sections only as appropriate*:**

11A. **International Collaboration**. Describe the nature of the collaboration and the expected international and scientific or engineering benefits to the research and education program. Include a description of the research facilities at the foreign site, as appropriate, and of the division of effort and expertise among the collaborators. **Limit: 1 page**.

11C. **Shared Experimental Facilities.** Describe the shared facilities to be established or collaborated with, including specific major instrumentation and plans for instrument development if any. Describe plan for maintaining and operating the facilities, including staffing and provision for user fees for outside users if appropriate. **Limit: 2 pages.**

11C. **Systems-Level Focus and Proof-of-Concept Testbeds.** Describe the system-level focus driving the research from discovery through the proof of concept, including design and/or development efforts and proof-of-concept testbeds. **Limit: 2 pages**

11D. **Connection to Design and Development Activities.** Describe connection to development of new technologies, design of new products, and partnerships in developing these activities. **Limit: 2 pages.**

11E. **Studies of Societal Implications.** Describe the research addressing the potential economic, legal, ethical and other societal implications of nanoscale technology**. Limit: 3 pages.**

Additional Information

a. Biographical Information.
Include a biographical sketch for each faculty-level (or equivalent) participant, listing up to ten publications most pertinent to this proposal. **Limit: 2 page for each investigator.** Enter in "Biographical Sketch" FastLane form.

b. **Current and Pending Support**.
List current and pending support for the Center Director **only**. Enter in "Current and Pending Support" FastLane form.

c. Reviewer Information
Enter the following information into the FastLane "List of Suggested Reviewers" form: (1) a list of individuals (and their affiliations) *outside* the participating institutions whose participation in the review of the full proposal might constitute a conflict of interest through association with the participants; and (2) a list of individuals who might be suitable to act as impartial reviewers.

d. Budgetary Information (Preproposals and Full Proposals)

Cost Sharing Requirements

Cost sharing at a level of 10% of the requested total amount of the total (five year) NSF funds is required for all proposals submitted as NSEC. The proposed cost sharing must be shown on line M of the proposal budget (NSF Form 1030). The narrative associated with cost sharing should be included in the "Budget Justification" form that is a part of the Budget Form.

Documentation of availability of cost sharing must be included in the proposal.

Only items that would be allowable under the applicable cost principles, if charged to the project, may be included in the awardee's contribution to cost sharing. Contributions may be made from any non-Federal source, including non-Federal grants and contracts, and may be cash or in kind (see OMB Circular A-110, Section 23). It should be noted that contributions counted as cost sharing toward projects of another Federal agency may not be counted towards meeting the specific cost sharing requirements of the NSF award.

All cost sharing amounts are subject to audit. Failure to provide the level of cost sharing reflected in the approved award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF.

Budget Pages

Submit budget pages for the Center for each year of support (1 through 5) and a five-year cumulative budget justification. FastLane will generate a five-year cumulative budget automatically. Provide separate budget pages for the lead institution and any subcontract budget information for other participating institutions.

e. Proposal Due Dates

Preproposals must be submitted via FastLane by 5:00 PM proposers' local time on November 2, 2000. NSF will issue letters of invitation by November 30, 2000 to submit full proposals. Full proposals are due on January 30, 2001.

Full proposals must be submitted via FastLane by 5:00 PM proposers' local time on January 30, 2001.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

NSF 00-119, NSEC, attn. Ulrich Strom, Room 1065N
National Science Foundation
DIS-FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

VIb. PROPOSAL REVIEW INFORMATION

Preproposals and proposals that do not adhere to the requirements described in this solicitation will be returned without review. Preproposals and proposals will be evaluated in accordance with NSF review criteria, namely (1) What is the intellectual merit of the proposed activity? and (2) What are the broader impacts of the proposed activity? (see section VIc). In addition, the evaluation will include the following criteria:

- The effectiveness of the vision to drive a well integrated and cross-disciplinary research program;
- The level of synergy of research, education, and integration of the Center as whole, providing it with the potential to make significant contributions to the advancement of nanoscience and engineering in one or more of the six research themes;
- The quality of the education and educational partnership programs;
- The effectiveness and appropriateness of the partnerships with industry, government laboratories and/or other users of research outcomes;
- The effectiveness of the activities to foster human resource development and enhanced participation of under-represented groups in science and engineering;
- The effectiveness of the proposed management plan for research and education, including mechanisms for setting priorities and allocating resources, plans for self-evaluation, and plans for ensuring a flexible and innovative program; and
- The appropriateness of the requested budget.

The evaluation may also include the following criteria to the extent that these *optional* activities are included in the proposal:

- The effectiveness of a systems-level focus in driving the research, and the appropriateness of proof of concept testbeds in integrating disparate research efforts.
- The effectiveness of the proposed collaboration with other U.S. and/or international centers, laboratories or groups
- The appropriateness and level of integration of the shared facilities;
- The effectiveness of the proposed collaboration with and access to national and other government facilities, as appropriate; and/or
- The effectiveness of plans to address the societal ramifications of advances in nanoscience and nanotechnology.

Preproposals will be evaluated by mail and/or panel review. Full proposals may be submitted by invitation only. Principal Investigators who will be invited to submit a full proposal will be notified by November 30, 2000.

Full Proposals will be evaluated in several stages of merit review, which may include mail review, panel review, and reverse site visits (involving a presentation at NSF). A proposal may be declined at any point in the review process.

C. NANOSCALE EXPLORATORY RESEARCH (NER)

IIc. GOALS AND STRUCTURE

This initiative is focused on research at the frontiers of nanoscale science and engineering, where exploratory research is a priority. This program component will emphasize exploratory, high risk - high quality nanoscale science and engineering research that would have a high potential for innovation if the research were successful. Such research is characterized as:

- Preliminary feasibility work on untested and novel ideas in nanoscale science and engineering with focus on one or a combination of the six themes described in section II of this solicitation;
- Ventures into emerging, far-reaching research ideas;
- Application of new expertise or new approaches; or
- Efforts likely to catalyze rapid and innovative advances.

Novel ideas that are not already widely researched and published will be supported. These ideas may be supported by only limited preliminary data. The project description should include:

- A statement showing the significant advancement in the proposal as compared to the state of the art;
- A clear statement as to why the proposed research should be considered particularly exploratory and high risk;
- The nature and significance of its potential impact on the field; and
- A plan for the feasibility demonstration within the time and cost guidelines must be included.

IIIc. ELIGIBILITY INFORMATION

Proposals may be submitted by U.S. academic institutions with undergraduate and/or Ph.D. programs in disciplines usually supported by NSF. Research may be proposed by individual investigators or by small groups from academic institutions. Synergistic collaboration among researchers and collaboration or partnerships with industry or government laboratories is encouraged when appropriate. Prospective applicants are encouraged to contact one of the program officers listed in this document for additional guidance on collaborations.

An institution (university or campus in a multi-campus university) may submit no more than **four** proposals in response to this NER solicitation on which it is the lead institution. The same institution may be a collaborative partner in any number of other multi-university group proposals in which it is not the lead. The Authorized Organizational Representative of that institution will make the selection of the proposals that are submitted. Proposals already submitted to other NSF programs or other federal agencies are not eligible for consideration by this competition. NER proposals involving more than one institution must be submitted as a single administrative package with the managing principal investigator from the lead institution.

IVc. AWARD INFORMATION

NER awards generally will be made as one year grants. NER awards will not exceed $100,000 and cannot be renewed. The project's duration will normally be one year. NSF plans to fund 35-45 awards in FY 2001. NSF expects to invest approximately $5 million in this initiative in FY 2001 funds. Anticipated date of awards: April 2001.

Vc. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: http://www.nsf.gov/.

Proposers are reminded to identify the program solicitation number (**NSF 00-119**) in the program announcement/solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*" and to select "**Exploratory Research**" from the FastLane org. unit pull-down list. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing. Exploratory Research proposals must be submitted by 5:00 p.m., submitter's local time, November 2, 2000 via the NSF FastLane system.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

NSF 00-119, NER, attn. Sohi Rastegar, Room 565S
National Science Foundation
DIS-FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

Investigators are strongly encouraged to contact the NSF staff members in the program covering the proposal topic before submitting an NER proposal. This will facilitate determining whether the proposed work is appropriate for NER.

Proposals that do not adhere to the requirements in this solicitation (topic, interdisciplinarity, total budget up to $100,000, deadline, and format including page limit) will be returned without review. Eligible proposals will be evaluated in accordance with the general NSF merit review criteria, namely (1) What is the intellectual merit of the proposed activity? and (2) What are the broader impacts of the proposed activity? (see section VIc of this solicitation) In addition, the following criteria will be used:

(1) The special level of innovation or breakthrough as compared to previous work
(2) Scarcity of scientific and engineering data in new, relevant fields of research and education
(3) The research plan for the feasibility demonstration

These proposals will be subject to merit review by panel or ad-hoc review as appropriate. Recommendations will be considered by NSF program officers from the participating programs in making funding decisions.

VIc. PROPOSAL REVIEW INFORMATION

General NSF review criteria

The specific review criteria for NIRT, NSEC and NER listed above will be applied in addition to **the general NSF review criteria** as shown below.

a. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. Program Officers charged with the oversight of the review process select these reviewers. NSF invites the proposer to suggest at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the

proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those criteria that are relevant to the proposal and for which he/she is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration in making funding decisions.

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens - women and men, underrepresented minorities, and persons with disabilities - is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are mailed to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

b. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this solicitation will be reviewed by panel and ad-hoc mail review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal review will consider the advice of reviewers and will formulate a recommendation.

NSF will attempt to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants Officer does so at its own risk.

VII. AWARD ADMINISTRATION INFORMATION

a. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.c, for additional information on the review process).

b. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1)* or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any NSF brochure, program guide, announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's web site at **http://www.nsf.gov/home/grants/grants_gac.htm**. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone 301-947-2722 or by e-mail from **pubs@nsf.gov** .

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, (NSF 95-26) available electronically on the NSF web site at **http://www.nsf.gov/cgi-bin/getpub?gpm**. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is 202-512-1800. The GPM may be ordered through the GPO web site at **http://www.gpo.gov**.

c. Reporting Requirements

For all multi-year awards (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. This system permits electronic submission and updating of project reports, including information on: project participants (individual and organizational); activities and findings; publications; and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries on Nanoscale Science and Engineering can be directed to one of the NSF staff named as a contact in this solicitation and from the dedicated websites: **http://www.nsf.gov/nano** and **http://www.nano.gov**. For questions related to the use of FastLane, contact the FastLane help line at 1-800-673-6188 or via email to **fastlane@nsf.gov**.

IX. OTHER PROGRAMS OF INTEREST

The NSF Guide to Programs is a compilation of funding for research and education in science, mathematics, and engineering. The NSF Guide to Programs is available electronically at **http://www.nsf.gov/cgi-bin/getpub?gp**. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices listed in Appendix A of the GPG. Any changes in NSF's fiscal year programs occurring after press time for the Guide to Programs will be announced in the NSF Bulletin, available monthly (except July and August), and in individual program announcements. The Bulletin is available electronically via the NSF web site at **http://www.nsf.gov/home/ebulletin**. Subscribers can also sign up for NSF's Custom News Service (**http://www.nsf.gov/home/cns/start.htm**) to be notified of new funding opportunities that become available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at (703) 292-8636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090, FIRS at 1-800-877-8339.

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PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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OMB 3145-0058
PT 34
KW 0605000, 0606000, 0607000, 0608000, 0609000, 0710015, 0706000, 1001000, 1003000, 1004000, 1009000, 1010000, 1013000, 1016000, 1220000, 1250000
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